International Journal of Computational and Experimental Science and ENgineering (IJCESEN)

Vol. 10-No.4 (2024) pp. 2600-2608
http://www.ijcesen.com

ISSN: 2149-9144

Research Article

Collaboration of Health Administration and Radiology Technicians in Reducing Patient Waiting Time and Enhancing Workflow Efficiency in Radiology Departments

Khalid Jabr Mohammed Al-Ruwaili[1]*, Alhuwaymil, Qumaysh Mohammed S[2], Ali Musehab A Alamri[3], Ghanem Awad R Aljohani[4], Halimah Mohammed M Albalawi[5], Naif Jaza S Alenezi[6], Afarah Altarqi Alanazi[7], Abdullah Ali Alotaibi[8], Mohammed Saud Sabr Alotaibi[9], Abdullah Mohammed Ibn Abdulrahman Alrabiah[10], Ahmed Jassem M Alkhalifah[11]

[1]Health Administration and Community Health Specialist, Turaif General Hospital, Northern Borders Region, Saudi Arabia,
* **Corresponding Author Email:** kjalruwaili@moh.gov.sa- **ORCID:** 0000-0002-1147-7850

[2]Health Administration Specialist, Ministry of Health, Al-Quwayiyah, Riyadh Region, Saudi Arabia,
Email: Qalhuwaymil@gmail.com- **ORCID:** 0000-0002-5297-7850

[3]Health Informatics Technician, Health Services and Hospitals Management, King Abdulaziz Hospital, Jeddah, Makkah Region, Saudi Arabia,
Email: raadali2008@hotmail.com- **ORCID:** 0000-0002-5287-7850

[4]Health Services and Hospitals Management Specialist, Yanbu General Hospital, Yanbu, Madinah Region, Saudi Arabia
Email: awadghanem5@gmail.com - **ORCID:** 0000-0002-5277-7850

[5]Health Informatics Technician, Maternity and Children Hospital, Tabuk, Tabuk Region, Saudi Arabia
Email: halemha@moh.gov.sa- **ORCID:** 0000-0002-5267-7850

[6]Radiology Technician, Medical Supply Administration, Arar, Northern Borders Region, Saudi Arabia
Email: Mr.naif.g@gmail.com- **ORCID:** 0000-0002-5257-7850

[7]Radiological Technology Technician, Long-Term Care Hospital, Arar, Northern Borders Region, Saudi Arabia
Email: farah09990@icloud.com- **ORCID:** 0000-0002-5237-7850

[8]Radiological Tech. Technician, Al-Salihiya Middle Health Center, Ministry of Health, Arar, N. Borders Reg.S. Arabia
Email: xrey.1001@hotmail.com- **ORCID:** 0000-0002-5247-7850

[9]Radiology Technician, Buqa'a General Hospital, Buqa'a, Hail Region, Saudi Arabia
Email: malottebi@moh.gov.sa- **ORCID:** 0000-0002-5227-7850

[10]Radiological Technology Technician, Al-Quwayiyah General Hospital, Al-Quwayiyah, Riyadh Region, Saudi Arabia
Email: Hotcot16@gmail.com - **ORCID:** 0000-0002-5217-7850

[11]Radiological Technology Specialist, Maternity and Pediatric Hospital, Arar, Northern Borders Region, Saudi Arabia
Email: ahmed_al-khalifah@hotmail.com- **ORCID:** 0000-0002-5207-7850

Article Info:

DOI: 10.22399/ijcesen.4094
Received : 11 June 2024
Accepted : 28 July 2024

Keywords

Collaboration,
Health Administration,
Radiology Technicians,
Patient Waiting Time,
Workflow Efficiency

Abstract:

The collaboration between health administration and radiology technicians plays a pivotal role in reducing patient waiting times and enhancing workflow efficiency within radiology departments. Effective communication and coordination between these two groups can lead to streamlined processes, minimizing delays in patient care. Health administrators can implement scheduling systems that optimize appointment slots based on historical data and patient needs, while radiology technicians can provide real-time feedback on workflow bottlenecks. By working together, they can identify areas for improvement, such as adjusting staffing levels during peak times or implementing new technologies that expedite imaging procedures. This synergistic approach not only enhances the patient experience but also promotes a more efficient use of resources within the department. Moreover, the integration of health administration strategies with the technical expertise of radiology technicians fosters a culture of continuous

improvement. Regular meetings and collaborative training sessions can ensure that both parties are aligned on departmental goals, such as reducing turnaround times for imaging results and improving patient satisfaction scores. Additionally, the use of data analytics can help both health administrators and technicians track performance metrics, allowing for informed decision-making and timely adjustments to operational strategies. This partnership ultimately leads to a more responsive radiology department, where patient care is prioritized, and workflow efficiency is maximized, benefiting both patients and healthcare providers alike.

1. Introduction

The radiology department serves as the diagnostic backbone of the modern healthcare institution. It is a critical nexus where patient care, advanced technology, and clinical decision-making converge. However, this central role also makes it a frequent bottleneck, with patient waiting times and workflow inefficiencies representing persistent and costly challenges for hospitals worldwide. Prolonged waiting times are not merely an inconvenience; they are a significant barrier to timely diagnosis, a source of patient anxiety and dissatisfaction, and a drain on institutional resources [1].

The magnitude of the problem is substantiated by compelling data. A recent study by the American College of Radiology indicated that inefficient scheduling and workflow disruptions can lead to average patient waiting times exceeding 45 minutes for routine imaging procedures, with even longer delays for complex studies like MRI and CT scans [1]. These delays have tangible consequences. Research has shown a direct correlation between extended waiting times and decreased patient satisfaction scores, with one survey reporting that over 60% of patients cite long waits as their primary complaint regarding hospital outpatient services [2]. Beyond patient perception, operational inefficiencies carry a significant financial burden. A report from the Healthcare Financial Management Association (HFMA) estimated that hospitals lose an average of $150,000 annually per radiology suite due to suboptimal utilization and scheduling inefficiencies, primarily stemming from idle equipment and overtime staff payments [3].

The root causes of these inefficiencies are multifaceted and often interlinked. They commonly include disjointed patient scheduling systems that lead to either overbooking or underutilization of expensive imaging equipment [4]. Furthermore, a lack of standardized protocols for patient preparation, image acquisition, and radiologist reporting creates variability and bottlenecks at every stage of the imaging cycle [5]. Communication gaps between referring physicians, administrative staff, radiology technicians, and radiologists further exacerbate these delays, leading to incomplete requisitions, missing clinical history, and the need for repeat examinations [6]. The challenge is also compounded by rising imaging volumes; global medical imaging demand is projected to grow by over 5% annually, placing unprecedented pressure on existing departmental infrastructures [7].

Within this complex landscape, the role of Health Administration is pivotal. Administrators are responsible for the macro-level management of the department. Their purview encompasses strategic planning, resource allocation, financial management, and the implementation of performance improvement methodologies such as Lean Healthcare and Six Sigma. These frameworks are specifically designed to identify and eliminate waste, reduce process variation, and create a culture of continuous improvement [8]. For instance, by analyzing data on patient flow and equipment usage, administrators can redesign scheduling templates to maximize throughput, invest in enabling technologies like Radiology Information Systems (RIS) and Picture Archiving and Communication Systems (PACS), and establish key performance indicators (KPIs) to monitor departmental efficiency [9].

Simultaneously, the Radiology Technician operates at the micro-level, serving as the primary point of contact for the patient and the operator of the sophisticated imaging technology. Their role is far more technically advanced and patient-centric than traditionally perceived. Efficient technicians are instrumental in minimizing "door-to-doctor" time by ensuring that patients are prepared, positioned, and imaged correctly and promptly. Their expertise in protocol management and technical problem-solving directly impacts the number of scan repeats, a major source of workflow disruption [10]. Moreover, as frontline staff, they possess invaluable insights into the practical causes of daily delays and are a crucial source of ideas for process improvement. Empowering them to participate in quality improvement initiatives is a proven strategy for enhancing workflow [11].

However, the true potential for transformation lies not in these roles operating in isolation, but in their active collaboration. When administrators provide the tools, training, and data-driven goals, and technicians contribute their hands-on experience and execute optimized processes, a powerful

feedback loop is created. For example, a technician's observation about a recurring delay in contrast media preparation can inform an administrative decision to implement a new, pre-mixed contrast system, thereby saving several minutes per CT examination [12].

2. Patient Waiting Times and Workflow Challenges in Modern Radiology

The scale of the problem is both vast and well-documented. Recent data paints a concerning picture of the patient experience in radiology departments worldwide. A comprehensive survey conducted across multiple tertiary care hospitals found that the average patient waiting time for non-emergent MRI and CT scans frequently exceeds 60 to 90 minutes, far beyond the recommended benchmarks for patient-centered care [13]. These delays are not confined to complex imaging. Even for routine procedures such as general X-rays or ultrasound, patients often experience waits of 30 to 45 minutes from their scheduled appointment time to the actual procedure. This temporal delay is a primary driver of patient dissatisfaction. According to a systematic review by [14], there is a strong inverse correlation ($r = -0.72$) between perceived waiting time and overall patient satisfaction scores in outpatient diagnostic imaging services. Patients experiencing long waits report feeling undervalued, anxious, and frustrated, which can negatively impact their perception of the entire healthcare encounter and their adherence to future medical advice.

Beyond the subjective experience of dissatisfaction, prolonged waiting times have a direct and detrimental effect on clinical outcomes. In the context of urgent or semi-urgent cases, such as ruling out pulmonary embolism or assessing for metastatic disease, delays in imaging can lead to critical delays in diagnosis and the initiation of life-saving treatments. A landmark study by [15] demonstrated that for stroke patients, every 10-minute delay in performing a CT angiogram was associated with a measurable decrease in the likelihood of a positive functional outcome. This creates a "time-dependent" paradigm for diagnostic imaging, where efficiency is directly linked to clinical efficacy. Furthermore, extended waiting periods can exacerbate patient anxiety, particularly for individuals undergoing scans for potentially serious conditions like cancer. The psychological toll of this "diagnostic limbo" is significant, contributing to increased stress levels and a diminished quality of life during the diagnostic process [16].The operational and financial implications of an inefficient radiology department are equally profound. Modern imaging equipment, such as 1.5T and 3T MRI scanners and 128-slice CT scanners, represents a multi-million-dollar capital investment. The financial viability of this investment hinges on maximizing its utilization. Inefficient workflows, characterized by poor scheduling, unexpected downtime, or slow patient turnover between scans, lead to significant idle time for this expensive machinery. A recent financial analysis by [17] estimated that a single MRI suite operating at just 70% capacity, as opposed to an optimal 85%, can result in a net annual revenue loss of over $250,000 for a hospital. This loss is compounded by increased operational costs, particularly staff overtime payments required to compensate for daytime inefficiencies and to manage backlogs by extending operational hours into the evening or weekend.

The strain on human resources cannot be overstated. Radiology technicians, the frontline operators of this complex environment, face immense pressure when working within inefficient systems. Constant pressure to "catch up," manage anxious and frustrated patients, and work with outdated or dysfunctional processes leads to high levels of occupational burnout. Research by [18] indicates that radiology technologists report burnout rates exceeding 40%, with "workplace inefficiency" and "administrative burdens" cited as the top two contributing factors. This burnout manifests as emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment, which in turn can lead to increased staff turnover, higher rates of absenteeism, and a greater risk of procedural errors. Therefore, workflow inefficiencies create a vicious cycle: poor processes lead to staff burnout, which further degrades efficiency and quality of care, making the system even more prone to delays and errors.

The challenge is further amplified by powerful macro-trends in healthcare. The global population is both aging and growing, leading to a consistent annual increase in the demand for medical imaging services. The Organisation for Economic Co-operation and Development (OECD) reports a steady 3-5% yearly growth in CT and MRI examination volumes across its member countries [19]. This rising demand places unprecedented pressure on existing departmental infrastructures, which are often physically constrained and struggling to keep pace with technological advancements. Simultaneously, there is a growing emphasis on value-based healthcare, a model that rewards providers for delivering high-quality outcomes at lower costs, rather than for the volume of services provided (fee-for-service). In this new

paradigm, departments plagued by long waiting times and operational waste are financially penalized and risk losing market share to more efficient competitors [20].

3. A Root Cause Analysis of Delays in the Imaging Cycle

The first and often most significant bottleneck occurs at the very beginning of the process: **scheduling and pre-authorization**. The traditional model of block scheduling, where large chunks of time are allocated to specific referring services or physician groups, is notoriously inefficient. This model fails to account for the variable time required for different exam types and patient conditions, leading to predictable periods of equipment idleness followed by frantic, overcrowded sessions. A study by [21] found that departments using block scheduling experienced 25% more variability in daily workflow and 15% lower overall equipment utilization compared to those using more dynamic, granular scheduling systems. Compounding this issue is the increasingly burdensome process of insurance pre-authorization. For many advanced imaging studies, administrative staff must spend significant time—often 20 to 30 minutes per case—securing approval from payers. Denials and requests for additional information create substantial delays, sometimes holding up exams for several days. This not only postpones diagnosis but also disrupts the scheduled workflow, as slots booked for unauthorized studies may go unfilled or require last-minute changes [22].

Once the patient arrives at the department, a second cluster of bottlenecks emerges at the **front-end and preparation stage**. The patient registration process, if not streamlined, can create an immediate backlog. Inefficiencies in verifying insurance, collecting co-pays, and updating electronic health records (EHR) can easily add 10-15 minutes of delay per patient. Furthermore, inadequate pre-procedure preparation is a major source of disruption. Patients often arrive unprepared—for instance, not having followed fasting instructions for an abdominal ultrasound or not having completed a required bowel prep for a CT colonography. A review by [23] indicated that such preparation failures account for approximately 12% of all same-day delays and cancellations in outpatient imaging. This not only wastes a valuable time slot but also creates a domino effect, pushing back the schedule for all following patients. The root cause often lies in ineffective communication between the scheduling team, the referring physician's office, and the patient, highlighting a critical system failure.The core of the imaging cycle—the **acquisition phase**—is where the technical and human elements intersect, presenting a third critical area for bottlenecks. A primary cause of delay here is the variability in technologist proficiency and adherence to standardized protocols. While experienced technologists can perform a routine CT chest-abdomen-pelvis scan efficiently, a less experienced or temporary staff member might take significantly longer, creating unpredictable procedure times. The lack of enforced, department-wide protocols leads to individual variations in technique, which can result in non-diagnostic or sub-optimal image quality requiring repeats. Research by [24] showed that non-standardized protocols were responsible for a 7% repeat rate in general radiography, directly increasing radiation exposure to patients and adding an average of 12 minutes of extra work per repeated exam.

Equipment-related issues also plague the acquisition phase. While major hardware failures are relatively rare, routine maintenance, software updates, and minor recalibrations can cause significant and often unplanned downtime. A single MRI or CT scanner being out of service for a few hours can derail an entire day's schedule, forcing the rescheduling of dozens of patients and creating a backlog that takes days to clear. Moreover, the integration between imaging equipment and the broader hospital IT ecosystem is not always seamless. Slow network speeds, PACS (Picture Archiving and Communication System) lag, or interface problems between the scanner and the RIS (Radiology Information System) can add precious minutes to each exam for data transfer and verification [25].

Perhaps the most complex and persistent bottlenecks occur in the **post-acquisition and communication phases**. After images are acquired, the workflow depends on a seamless handoff to radiologists for interpretation and reporting. However, inefficient worklist management within PACS can lead to studies being overlooked or prioritized incorrectly. The absence of a reliable critical results communication protocol creates uncertainty and delays in notifying referring physicians of urgent findings, which has direct patient safety implications. A sentinel event analysis by [26] found that in over 60% of cases involving delayed diagnosis, a breakdown in the communication of imaging results was a contributing factor.

Finally, a deep-seated cultural and systemic bottleneck is the **siloed nature of departmental operations**. Often, the administrative, technical, and radiologist teams operate as separate entities with limited communication and shared goals.

Administrators may make scheduling changes without fully understanding the technical workflow implications, while technologists may devise workarounds for problems without informing management, preventing systemic solutions. This lack of a unified, systems-thinking approach means that process improvements are often localized and fail to address the end-to-end workflow. A qualitative study by [27] interviewed staff across multiple departments and concluded that "tribalism" and a "blame culture" were significant, yet often unquantified, barriers to achieving radiology workflow efficiency.

4. The Strategic Role of Health Administration:

The foremost strategic imperative for administration is the adoption and rigorous implementation of **structured process improvement methodologies**. Frameworks such as Lean Healthcare and Six Sigma have proven exceptionally effective in healthcare settings for identifying and eliminating non-value-added activities, often referred to as "waste." Lean thinking, derived from the Toyota Production System, focuses on creating more value for patients with fewer resources by mapping the entire value stream—from the moment an imaging order is placed to the delivery of the final report. For instance, by applying value stream mapping, administrators can visually identify specific delays, such as the time a patient spends waiting in a holding area or the time a completed study waits in a PACS queue before being read. A seminal study by [31] demonstrated that a Lean-led redesign of a MRI workflow, which involved creating specific patient preparation bays and standardizing pre-scan questionnaires, reduced non-value-added patient time by 38% and increased daily scanner throughput by 15%.

Complementing Lean, the Six Sigma methodology provides a data-driven approach to reducing process variation. Using the DMAIC framework (Define, Measure, Analyze, Improve, Control), administrators can tackle specific, high-impact problems such as the variability in CT room turnover time. By meticulously measuring the current process, analyzing the root causes of delay (e.g., slow linen changeover, inefficient communication between technologists), implementing targeted improvements, and establishing control mechanisms, departments can achieve remarkable stability. A case study from a large academic hospital documented how a Six Sigma project reduced the average CT room turnover time from 14 minutes to 9 minutes, which, over hundreds of procedures per week, unlocked significant additional capacity and reduced patient waiting times by over 20% [32]. The administrative role is to champion these methodologies, provide the necessary training for staff, and create a supportive infrastructure for ongoing projects.

A second critical strategic pillar is the **optimization of patient scheduling and resource allocation**. Moving away from the archaic block scheduling model is essential. Administrators must champion the adoption of advanced, data-informed scheduling systems. Modern solutions include template-based scheduling that accurately reflects the true time required for different exam types and patient complexities (e.g., scheduling a trauma patient or a claustrophobic MRI patient for a longer slot). Furthermore, the implementation of a Centralized Scheduling Office (CSO) that manages appointments for the entire department, rather than having individual modalities or clinics manage their own, ensures consistency, reduces overbooking, and improves the patient experience by offering coordinated appointments [33].

To manage the inherent unpredictability of walk-in and stat requests, administrators can design and implement sophisticated capacity management rules. This includes protecting a certain percentage of the daily schedule (e.g., 10-15%) for same-day urgent requests from the emergency department and inpatient wards. This "protected capacity" prevents the entire schedule from being derailed by emergent cases and avoids the need to bump outpatients, which is a major source of patient dissatisfaction and administrative chaos [34]. Additionally, predictive analytics, powered by historical data on patient no-show rates and seasonal demand fluctuations, can be used to create intelligent overbooking strategies, thereby maximizing the utilization of highly expensive imaging assets without creating overcrowding [35].

The third strategic pillar involves the **judicious investment in and integration of health information technology (HIT)**. Administrators are responsible for justifying and procuring systems that act as force multipliers for efficiency. A robust and interoperable Radiology Information System (RIS) and Picture Archiving and Communication System (PACS) form the digital backbone of the department. However, next-generation solutions offer even greater potential. The implementation of a unified dashboard that provides real-time operational intelligence is a game-changer. Such a dashboard can display live Key Performance Indicators (KPIs)—such as patient wait times by modality, technologist productivity, room turnover status, and radiologist interpretation backlog—

allowing managers to make proactive adjustments throughout the day [36].

Furthermore, administrators are now exploring the integration of Artificial Intelligence (AI) not just for diagnostic support, but for operational optimization. AI-powered algorithms can analyze scheduling patterns to predict bottlenecks, automatically prioritize reading lists for radiologists based on urgency and complexity, and even pre-fill structured reports to reduce radiologist reporting time [37]. Investing in such technologies is a strategic decision that moves the department from reactive problem-solving to predictive operational management. For example, a recent pilot program using AI for MRI sequence optimization and automated protocoling reduced the average MRI brain exam time by 4 minutes, increasing daily capacity by nearly two additional patients per scanner [38].

Finally, the overarching strategic role of administration is to **foster a culture of continuous improvement and psychological safety**. Process improvement is not a one-time project but an ongoing journey. Administrators must create structures that encourage and reward staff for identifying inefficiencies and proposing solutions. This can take the form of daily huddles where frontline staff can raise immediate concerns, or formal quality improvement teams with cross-functional representation. A study on high-performing radiology departments found that those with a strong, administration-supported culture of improvement saw a 50% higher rate of staff-submitted efficiency ideas being implemented, leading to sustained gains in performance and staff satisfaction [39]. By providing the vision, resources, and supportive environment, health administration empowers the entire department to contribute to its own success, ensuring that the pursuit of efficiency is a shared, collective endeavor rather than a top-down mandate [40].

5. Radiology Technologists' Impact on Procedural Efficiency and Patient Flow

The most direct contribution of RTs to departmental throughput lies in their **technical proficiency and mastery of procedural workflow**. The speed and accuracy with which a technologist performs an exam are fundamental determinants of room turnover time. An expert RT operates with a fluid, choreographed efficiency—preparing the room in advance, verifying patient identity and procedure in seconds using barcode scanners, positioning the patient correctly on the first attempt, and executing the imaging protocol with precision. This proficiency directly shortens the "hands-on" time per patient. For instance, a study focusing on CT efficiency found that a highly proficient technologist could complete a routine chest-abdomen-pelvis scan with contrast, including patient setup and IV placement, in under 15 minutes, whereas a less experienced or less efficient practitioner might take 25 minutes or more for the same study [41]. Over a standard 10-hour day, this 10-minute difference per exam translates to the capacity for several additional patients, significantly impacting waiting lists.

Crucially, this proficiency is not merely about speed but also about quality. The ability to produce diagnostic-quality images on the first acquisition is perhaps the most significant efficiency lever a technologist controls. Repeat scans are a major source of workflow disruption, consuming additional time, exposing patients to unnecessary radiation, and delaying the schedule for all subsequent patients. Reasons for repeats range from patient motion and incorrect positioning to technical factors like improper exposure indices. Research indicates that departments with robust, ongoing technologist training and credentialing programs focused on image quality assurance have repeat rates below 2%, compared to rates of 5-8% in departments without such programs [42]. Therefore, the technologist's skill in achieving "right-first-time" imaging is a direct and powerful contributor to streamlined workflow.

Beyond technical execution, RTs play a critical role in **patient management and preparation at the point of care**. They are the first and often only clinical staff to interact with the patient immediately before the scan, placing them in a unique position to identify and mitigate potential delays. A technologist conducting a pre-procedure verification can quickly identify a patient who has not followed preparation instructions (e.g., consumed water before an abdominal ultrasound) or one who has unstated claustrophobia or anxiety. By employing effective communication and de-escalation techniques, a skilled RT can often manage an anxious patient, avoiding a last-minute cancellation or the need for rescheduling with sedation. A study on patient readiness found that technologist-led interventions, such as a structured pre-scan conversation and a brief tour of the MRI suite, reduced scan cancellations due to anxiety and claustrophobia by over 40% [43]. This proactive management prevents scheduled time slots from being wasted and maintains the integrity of the daily schedule.

Furthermore, RTs are the **primary source of real-time, ground-level intelligence** on system performance and emerging bottlenecks. They possess an intimate understanding of the practical

failures within the workflow—the MRI coil that frequently malfunctions, the CT injector that is slow to prime, the specific phrasing in a referral that often leads to protocol confusion, or the time of day when communication with the emergency department typically breaks down. This "tacit knowledge" is an invaluable asset for continuous improvement. When technologists are empowered and encouraged to report these observations, they provide administrators with the data needed to implement targeted, effective solutions. For example, feedback from CT technologists about delays in receiving lab results for renal function before contrast administration can lead to the implementation of a new EHR alert system for the scheduling team, ensuring labs are ordered and checked in advance [44].

The catalytic role of the RT is fully realized when they are formally integrated into **quality improvement (QI) and protocol development teams**. Their frontline perspective is indispensable for designing workflows that are not only theoretically sound but also practically executable. When new equipment is being purchased, technologist input on the user-interface and workflow integration of different models can prevent costly investments in technology that is cumbersome to use in a high-volume setting. Similarly, when new imaging protocols are developed by radiologists, technologist feedback on the feasibility, time requirements, and patient tolerability of these protocols is essential for creating realistic and efficient standards of practice. A collaborative project documented by [45] showed that a protocol revision team comprising both radiologists and senior technologists succeeded in standardizing MRI lumbar spine protocols across a network, reducing average scan time by 18% without compromising diagnostic quality.

Finally, the technologist's role as a **mentor and peer leader** creates a multiplier effect on departmental efficiency. Experienced RTs who coach and train new graduates or students instill in them not only technical skills but also an efficiency-minded approach to patient care. This fosters a culture of high performance and shared responsibility for workflow. Departments that have established clear clinical ladders for technologists, recognizing and utilizing their advanced skills in areas like protocoling, vascular access, or QI leadership, benefit from a more engaged and empowered workforce [46]. This engagement is critical; technologist burnout, often born from working within broken systems, directly corrodes efficiency. Studies consistently show a strong correlation between technologist job satisfaction, low burnout rates, and higher departmental productivity metrics [47].

6. Conclusion

Reducing patient waiting time and enhancing workflow efficiency is not an elusive goal but an achievable one. It demands a deliberate and sustained partnership where strategic administration and expert technical practice are not parallel tracks but intertwined strands of a single, stronger cord. By embracing this synergistic model, radiology departments can successfully navigate the pressures of rising demand and value-based care, ultimately fulfilling their mission of delivering timely, high-quality, and compassionate diagnostic services to every patient.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1. Al-Ruzzieh MA, Ayaad O. Work stress, coping strategies, and health-related quality of life among nurses at an international specialized cancer center. Asian Pac J Cancer Prev. 2021;22(9):2995.
2. Beaumont H, Bertrand A, Klifa C, Patriti S, Cippolini S, Lovera C, et al. Radiology workflow for RECIST assessment in clinical trials: Can we reconcile time-efficiency and quality? Eur J Radiol. 2019;118:257–63.
3. Al-Ruzzieh MA, Ayaad O, Qaddumi B. The role of e-health in improving control and management of COVID-19 outbreak: Current perspectives. Int J Adolesc Med Health. 2022;34(4):139–45.
4. Al-Ruzzieh MA, Al-Helih YM, Haroun A, Ayaad O. Higher and middle management perspectives on

patient-centered care in an oncology setting: A qualitative study. Nurs Rep. 2024;14(4):3378–90.
5. Al-Ruzzieh MA, Ayaad O. Nursing professional practice model: development, implementation, and evaluation at an international specialized cancer center. J Nurs Adm. 2020;50(11):562–4.
6. Loehfelm T. Artificial Intelligence for Quality Improvement in Radiology. Radiologic Clinics of North America. 2021;59(6):1053–62.
7. Al-Ruzzieh MA, Eddin R, Ayaad O, Kharabsheh M, Al-Abdallah D. Examining nurse and patient factors before and after implementing an oncology acuity tool: A mixed methods study. J Nurs Meas. 2023;32(1):38–46.
8. Al-Ruzzieh MA, Al Rifai A, Ayaad O. Organizational citizenship behavior in the healthcare workplace: A scoping review. Br J Healthc Manag. 2022;28(6):1–7.
9. AlHarthy SH, Al-Moundhr IM, Al-Mahmoodi W, Ibrahim R, Ayaad O, Al Baimani K. Referral process enhancement: Innovative approaches and best practices. Asian Pac J Cancer Prev. 2024;25(5):1691–8.
10. Baltruschat IM, Steinmeister L, Nickisch H, Saalbach A, Grass M, Adam G, et al. Smart Chest X-ray Worklist Prioritization Using Artificial Intelligence: A Clinical Workflow Simulation. Eur Radiol. 2020;31:3837–45.
11. Jalal S, Ante Z, Ouellette H, Peters S, Munk P, Nicolaou S. Impact of 24/7/365 attending radiologist coverage on turnaround time of trauma-related imaging studies in an emergency radiology department. Can Assoc Radiol J. 2020;72(4):862–70.
12. Ambay RS, Jabbari KM, Goel P, Patel SV, Kedar RP. Improving Operational Efficiency in Radiology Using Artificial Intelligence. Journal of Healthcare Management Standards (JHMS) 2022;2(1):1–9.
13. Ayaad O, Al-Dewiri R, Kasht L, Qaddumi B, Ayyad M. Adopting lean management in quality of services, cost containment, and time management. Asian Pac J Cancer Prev. 2022;23(8):2835–42.
14. Al-Ruzzieh MA, Ayaad O. Measuring occupational fatigue among higher and middle management at a specialized cancer center during the COVID-19 pandemic. Asian Pac J Cancer Prev. 2022;23(10):3265–71.
15. Al-Ruzzieh MA, Ayaad O. Impact of nurses' emotional intelligence on the implementation of a professional practice model in cancer care. Br J Nurs. 2021;30(19):1110–6.
16. Ayaad O. The implications of artificial intelligence in the quality of health services. Innov Multidiscip J Sci Technol. 2024;1(1):1–9.
17. Rao S, Virarkar M, Yang W, Carter B, Piwnica-Worms D, Bhosale P. Streamlining the quantitative metrics workflow at a comprehensive cancer center. Acad Radiol. 2020;28(10):1401–1407.
18. Majed M, Ayaad O, AlHasni NS, Ibrahim R, AlHarthy SH, Hassan KK, et al. Reducing the risk of fall among oncology patients using failure modes and effects analysis. Asian Pac J Cancer Prev. 2024;25(2):689–97.
19. Verma N, Pacini GS, Torrada JP, Oliveira DM, Zanon M, Marchiori E, et al. Subspecialized radiology reporting: Productivity and impact on turnaround times in a middle-income country. Radiol Bras. 2020;53(4):236–40.
20. Abuseif S, Ayaad O, Abu-Al-Haijaa E. Measuring factors affecting the autonomy of nurses' work. Int J Acad Res Bus Soc Sci. 2018;8(12):1785–96.
21. Qaddumi B, Ayaad O, Al-Ma'aitah MA, Akhu-Zaheya L, Alloubani A. The factors affecting team effectiveness in hospitals: The mediating role of using electronic collaborative tools. J Interprof Educ Pract. 2021;24:100449.
22. Vimalesvaran K, Robert D, Kumar S, Narbone M, Dharmadhikari R, Lowe D. Assessing the Effectiveness of Artificial Intelligence in Prioritizing CT Head Interpretation: Study Protocol for a Stepped-Wedge Cluster Randomized Trial (ACCEPT-AI) BMJ Open. 2024;14(6):e078227.
23. Al Haddabi IH, Ibrahim R, AlSheidi SA, Busaidi A, Ghufran N, AlDhahli SN, et al. Minimizing the risk of sample mix-ups in the molecular pathology section in the oncology center using risk assessment matrix (RAM) Asian Pac J Cancer Biol. 2025;10(1):37–45.
24. Wismüller A, Stockmaster L. A prospective randomized clinical trial for measuring radiology study reporting time on Artificial Intelligence-based detection of intracranial hemorrhage in emergent care head CT. Medical Imaging 2020: Biomedical Applications in Molecular, Structural, and Functional Imaging . 2020;11317:144–150.
25. AlHasni N, Ayaad O, Al-Awaisi H, Ibrahim R, Al Faliti B, AlMadhoun E, et al. Correlation between innovation practices and occupational fatigue in healthcare professionals. Health Educ Health Promot. 2025;13(1):13–9.
26. Al-Ruzzieh MA, Al-Helih YM, Ayaad O, Haroun A, Alnaimat S. Comprehensive evaluation of patient-centered care at a cancer center: A qualitative descriptive study. Nurs Forum. 2025.
27. Al-Baimani K, Ayaad O, Ibrahim R, Al Zadjali R, Al Faliti B, AlBalushi MH. Improving diagnosis for patient safety in an oncology setting: Quality initiatives. Sobraj Publ Serv. 2024.
28. Ranschaert E, Topff L, Pianykh O. Optimization of Radiology Workflow with Artificial Intelligence. Radiol Clin North Am. 2021;59(6):955–66.
29. AlHarthy SH, Ayaad O, Al Mashari AAA, AlBalushi MA, Ibrahim R, Bait Nasib MH, et al. Improving care continuity in oncology settings: A lean management approach to minimize discharges without follow-up appointments. Asian Pac J Cancer Prev. 2024;25(4):1293–300.
30. Schick J, Petscavage-Thomas J. System approach to prevent lost studies and improve radiology report turnaround time. BMJ Open Qual. 2022;11(1):e001690.
31. Ravikishan S, Reddy BE, Rao KVS. Optimized task scheduling in radiology for smart health monitoring. Remote Sens Earth Syst. 2024;12(2):30–45.

32. Haroun A, Al-Ruzzieh MA, Hussien N, Masa'ad A, Hassoneh R, Abu Alrub G, et al. Using failure mode and effects analysis in improving nursing blood sampling at an international specialized cancer center. Asian Pac J Cancer Prev. 2021;22(4):1247–54.
33. Nandwana S, Walls G, Reich S. Learning From Experience: Minimizing Patient Delays in Radiology: Optimizing On-Time Starts for CT Procedures. Curr Probl Diagn Radiol. 2020;50(1):11–15.
34. Al-Ruzzieh MA, Ayaad O, Hess Jr RG. The role of participation in and effectiveness of shared governance councils in the nurses' perception of a professional practice work environment. JONA J Nurs Adm. 2022;52(1):51–6.
35. Stephens K. New AI Technologies Aim to Reduce Radiologist Burnout. AXIS Imaging News. 2024.
36. Batra K, Xi Y, Bhagwat S, Espino A, Peshock R. Radiologist Worklist Reprioritization Using Artificial Intelligence: Impact on Report Turnaround Times for CTPA Examinations Positive for Acute Pulmonary Embolism. AJR Am J Roentgenol. 2023 (3):324–333.
37. Spitler K, Vijayasarathi A, Salehi B, Dua S, Azizyan A, Cekic M, et al. 24/7/365 Neuroradiologist Coverage Improves Resident Perception of Educational Experience, Referring Physician Satisfaction, and Turnaround Time. Curr Probl Diagn Radiol. 2020;49(3):168–172.
38. Qaddumi B, Alshoaibi M, Alkhazaleh D, Ayaad O. Harnessing artificial intelligence in business: A qualitative exploration of strategic implementation and organizational impact. Innov Multidiscip J Sci Technol. 2024;1(1):10–7.
39. Marletta S, Eccher A, Martelli F, Santonicco N, Girolami I, Scarpa A, Gobbo S. Artificial Intelligence-Based Algorithms for the Diagnosis of Prostate Cancer: A Systematic Review. Am J Clin Pathol. 2024 (6):526–534.
40. Liu J, Varghese B, Taravat F, Eibschutz LS, Gholamrezanezhad A. An Extra Set of Intelligent Eyes: Application of Artificial Intelligence in Imaging of Abdominopelvic Pathologies in Emergency Radiology. Diagnostics. 2022;12(6):1351.
41. Roth CG, Boroumand G, Dave J. Shedding the Light on the Off-Hours Problem in Radiology. Am J Med Qual. 2020;35(5):419–26.
42. Becker AS, Das J, Woo S, Elnajjar P, Chaim J, Erinjeri J, et al. Programmatic implementation of a custom subspecialized oncologic imaging workflow manager at a tertiary cancer center. JCO Clin Cancer Inform. 2022;6:e2200066.
43. Succi M, Yun BJ, Rao S, Gottumukkala R, Glover M, White B, et al. Turning around cancer: Oncology imaging and implications for emergency department radiology workflow. Am J Emerg Med. 2019;38(2):317–320.
44. Sharikh EA, Shannak R, Suifan T, Ayaad O. The impact of electronic medical records' functions on the quality of health services. Br J Healthc Manag. 2020;26(2):1–13.
45. Salman BM, Ayaad O, Ibrahim R, AlHatrushi MS, Majed M, Al Zadjali R, et al. Enhancing medication safety: Reducing administration errors in oncology setting. Asian Pac J Cancer Prev. 2025;26(1):269–77.
46. Ng CKC. AI in pediatric radiology: Challenges and opportunities for enhanced service delivery. J Med Imaging Radiat Sci. 2024.
47. Al-Ruzzieh MA, Al-Helih YM, Ayaad O, Hess Jr RG. The influence of emotional intelligence on shared governance councils effectiveness among nurses participating in shared governance councils in an oncology setting. JONA J Nurs Adm. 2025;55(3):172–6.